Suraj Venkati Sawant

Mobile No:-7038577542

Email ID:-surajsawant081@gmail.com

Category:-SC

Subject:-Zoology (Life Science)

Research Topic:- Effects of Nitrate and Phosphate on fresh water Crab *Barytelphusa cunicularis*

Guide Name:-Dr. Vidya. V.Bhoyar

Guide Mobile No:-9923909288

Guide Email ID:-patil.vidya81@gmail.com

Effects of Nitrate and Phosphate on fresh water Crab *Barytelphusa cunicularis*

A

Synopsis

Submitted to

Swami RamanandTeerth Marathwada University, Nanded (MH)

For the registration of

Doctor of Philosophy

In

Zoology

(Faculty of Science & Technology)

By

Mr. Suraj Venkati Sawant

Under the guidance of

Dr. Vidya V. Bhoyar

M.Sc., Ph.D.

AssistantProfessor and Head of Department of Zoology

Late Babasaheb Deshmukh Gorthekar College of Arts, commerce, Science, Umri

March - 2022

Effects of Nitrate and Phosphate on fresh water Crab *Barytelphusa cunicularis*

1] A brief resume of proposed work/problem:

This research is proposed to examine the effect of nitrate and phosphate pollutants on fresh water animal like crab surrounding Godavari River at Nanded city. The identification of pollutants presents in water and fresh water crab by suitable testing techniques. This research also examines effects of pollutant on oxygen and carbon dioxide level in water.

2] Introduction

Water is inorganic, transparent, tasteless, odourless and near about colourless substance. It is considered and uses as universal solvent. We called it as life even though it provides no calories or organic nutrients. The word *water* is originated from Old English word waeter, H_2O is chemical formula of water. Water is found in nature nearly always includes various dissolved substances, and special steps or technique are required to obtain chemically pure water. Water is the only one common substance to exist as in a solid, liquid, and gas in normal terrestrial conditions. Water is considered to be neutral, with a pH of 7.

Water is different from most of the other liquids present on earth. It becomes less dense as it can freezes in low temperature. Pure water is usually tasteless and odourless. Pure water is visibly blue in colour due to immersion of light in the region.

Water is the life-blood of an ecosystem, as it carries to all parts of the system a variety of chemicals needed for photosynthesis, respiration, and other essential life processes.So that indirectly we all know that water is essential product for our life without it we can't imagine our living and non-living cycles even for few seconds.

Water fit or suitable or safe for human ingestion is called drinking water or potable water. If water is not potable or drinkable, then it may be made potable by filtration or distillation, or by a range of other methods.

Water which is not fit or safe for drinking this not means that this type of water is harmful to humans when used for swimming or bathing is called by various names other than potable or drinking water, sometimes called safe water, or "safe for bathing".Water for bathing may be maintained in suitable microbiological condition using chemical disinfectants such as chlorine or ozone or by the use of ultraviolet light. Water recovery (renovation) is the process of converting waste water.

In some countries, seawater is widely used for flushing toilets and cleaning the dirt from roads and public places.Polluting water may be the biggest single waste of water; like other types of pollution, this does not enter standard accounting of market costs, being considered

as externalities. Many industrial processes and procedures such as mining, chemical crushing, pulp bleaching, paper manufacturing, textile production, dyeing, printing, and cooling of power plants are depending on reactions using chemicals dissolved in water, suspension of solids in or to wash products or process equipment. These processes use large amounts of water, requiring a dedicated water source, and often cause significant pollution ofwater.

Water whose composition has been changed to the extent to unusable that water calledas polluted water (WHO). In other words, it is toxic water that cannot be drunk or used for essential purposes like agriculture, and which also causes diseases like diarrhoea, cholera, dysentery, typhoid and poliomyelitis that kill near about more than thousands of peoples worldwide every year.

Pollutants are the substance which responsible for to cause change in water quality it may be chemical or its physical properties. The main water pollutants are bacteria, viruses, parasites, fertilisers, pesticides, pharmaceutical products, nitrates, phosphates, plastics,faecal waste and even radioactive substances. These substances are not always responsible for to change thewater colour that is they are invisible pollutants. That's why small amounts of water and aquatic organisms are tested to determine water quality.

Themain categories of water pollutants: pathogens, inorganic compounds, organic material and macroscopic pollutants, suspended solids, nutrients and agriculture pollutants, thermal, radioactive, and other pollutants.

Nitrate and phosphate can present naturally in surface water and groundwater at a level that does not generally cause health problems. At certain amount they are not harmful to body.

Phosphate Doses in Drinking Water may cause Changes in Biofilm of water. Phosphates are safe to ingest at reasonable levels. They are important complexed components of all plant and animal-based foods that we consume because they are components of all cells.

Crabs(*Barytelphusacunicularis)* live in all the world's oceans, in fresh water, and on land. These crabs are generally found in Nanded localities. They are generally covered with a thick exoskeleton, and have a single pair of pincers. It is believed thatthey first appeared during the Jurassic Period. Crabs are found in all of the world's oceans, as well as in fresh water and on land, particularly in tropical regions. About 850 species are freshwater crabs. Crabs belong to the subphylum Crustacean, the largest group of marine arthropods. Crab is packed with protein, which is important for building block and maintaining material for muscle. Crab also contains high levels of other nutrients which play very important roles in improving general health while helping prevent a variety of chronic conditions.

Release of untreated water from industrial uses is pollution. Industry requires pure water for many uses and utilizes a variety of purification techniques both in water supply and release. Water is also used for dishwashing.Sometimes humans require water with few impurities. Common impurities may be Metal salts and oxides, copper, iron, calcium and

lead and harmful bacteria. Some solutes are suitable and even needed for taste improvement and to provide needed electrolytes. Water has a high heat of vaporization and is relatively inactive, which makes it a good fire extinguishing fluid.In the nuclear power industry, water can also be used as a neutron arbitrator. In most nuclear reactors, water is both a coolant and an arbitrator.

Appropriately, much of our water on earth is polluted and it is one of the major crises facing the world today. There are many causes of water pollution and we haveneeded to take several measures in order to save this precious resource. Humans depend on clean water to not only survive but also to flourish. Sadly, availability of clean water is becoming harder and harder each year.Aquatic animals are brilliant indicators of environmental conditions and health in aquatic system because they are sensitive to changes in water value. They respond very quickly to low dissolved oxygen levels, high nutrient levels, toxic contaminants, poor food quality or abundance, and predation.

The quantitative and qualitative richness of the phytoplankton and zooplankton were significantly linked by current water quality conditions. Aquatic animals (Phytoplankton and zooplankton) are good indicators for changes in nutrient pollution over time because they respond quickly to changes in nutrient input to the pond. Many environmental factors can disturb zooplankton collections, including water temperature, nutrient concentrations, and salinity.

3] Review of Literature:

Extensive review on the ecotoxicological implications of nanoparticles mostly on carbon nanotubes and graphene on aquatic environment, where most of the findings showed that the concentrations in orders of ng/L in aquatic environment were much lower compared to the lowest observed toxicity effect concentrations (in order of mg/L). It was revealed that the toxicity effects on aquatic organisms were due to short-term laboratory experiments where the carbon nanoparticles were at high concentrations. It was further observed that the degree of the toxicity depends on the type of the organism, exposition duration, and the method of carbon nanoparticle synthesis. (Freixa et al. 2018).

It is observed that several crustaceans can detect eutrophication and show avoidance or escape behaviour. It was reported that blue crab (Callinectessapidus) can avoid hypoxic conditions by migrating to locations with more favourable oxygen concentrations. A decline in feeding rate was also reported in blue crabs when exposed to hypoxia, (Bell et al. 2003b)

Among the several factors that could enhance the robustness of the current mercury models were quality of input data and understanding of chemical transportation and biogeochemistry. Also, many studies showed that the lack of limited field data for the model validations affects the understanding of the various environmental stressors influencing the fate of mercury in the aquatic environment including the water column and the benthic sediments. (Zhu et al., 2018).

It has been showed that increased concentration of chloride, nitrate and phosphate can be used as bioindicator of pollution as the plankton population was found to be increased (Trivedi and Goel, 1986).

The effects of waterborne native and metabolite antidepressant on nontarget freshwater aquatic animals. It was further shown that tricyclic antidepressant exposure was associated with the mortalities, retardation, and pathological aberrations in the development of the heart, brain, and cranial organs of fishes. Thus, according to the current scientific knowledge, antidepressants in surface waters cause abnormalities in the behaviors, reproduction, and growth of aquatic organisms (Sehonova, Svobodova, Dolezelova, Vosmerova, and Faggio2018).

Frequency of antibiotic occurrence and the concentrations levels in various compartments of aquatic lakes in China. It was found that about 39 different antibiotics were detected with quinine antibiotics posing the greatest ecotoxicological risk among the aquatic organisms. However, the antibiotic concentrations were very low in most aquatic organisms compared to their maximum residual limits, and also, high antibiotic resistance genes were observed in many lakes Liu, Lu, et al. (2018).

The impacts of anthropogenic pollutants and pathogen distributions in response to global climate change were reviewed on mountainous freshwater. Findings indicate that these

changes will cause the establishment of pathogens in new environment posing negative effects on freshwater aquatic organisms(Schmeller et al., 2018).

High levels of nitrate in well water often result from improper well construction, well location, overuse of chemical fertilizers, or improper disposal of human and animal waste. You cannot taste, smell, or see nitrate in water. Consuming too much nitrate can be harmful—especially for babies. Consuming too much nitrate can affect how blood carries oxygen and can cause methemoglobinemia (also known as blue baby syndrome). High levels of nitrate in drinking water may increase the risk of colon cancer. Nitrate may enhance the cancer potential of other compounds or may turn into cancer-causing chemicals like the body. Nitrate in drinking water has not been shown to increase the risk of other kinds of cancer. Human lethal doses of 4–50 g (equivalent to 67–833 mg kg^{-1} body weight) have been reported. Toxic doses range from 2 to 5 g (RIVM, 1989, WHO, 2011) of NO_3. Water utilities treat drinking water by adding phosphate to prevent metal dissolution from water pipe work systems and particularly lead poisoning. If all phosphorus is used, plant growth will cease, no matter how much nitrogen is available. The natural background levels of total phosphorus are generally less than 0.03 mg/L. The natural levels of phosphate usually range from 0.005 to 0.05 mg/L.

This process may result in oxygen depletion of the water body. (Source) Typically, a lake will have a total phosphorus concentration of >0.035 mg/L, a chlorophyll concentration > 0.025 mg/L, and a mean secchi-depth of from 0.5 to 2 meters.

Heavy metal induces certain metabolic and physiological changes in aquatic organisms under stress (Srinivas et al., 2000).

The importance of nitrate and phosphate content in water bodies showed a direct relationship with phytoplankton. Content of nitrate and phosphate also favoured good growth of blue green algae. Some of the parameters were also act as indicators of sewage pollution such as chloride, phosphate and nitrate. It showed increased concentration of chloride, nitrate and phosphate during summer and winter by which planktonic population found to be increased which also act as bioindicator of pollution. The total phosphate content in water was due to mixing up of agricultural runoff.

4] Objectives:

- The objective of this research is to study the effects of pollutants (nitrate and phosphate) exposed to the crab and its surrounding environment.
- This study will deal with the effect of pollutants (nitrate and phosphate) on fresh water crab in different aspects like effect on growth rate, its muscles, hepatopancreas, and effect on its behaviour.
- This study will also deals with the study of effects of nitrate and phosphate on feeding and metabolism of crab.As in many regions of Maharashtra, crab used as one of the food type. So directly or indirectly pollutant affects our body through the crab.
- Crab present in water and near to water placed in muddy region. Study will find the any relation of crab with water quality.
- This research deals with the water quality (pollution level) in pollutant added environment. Study also deals with the pollutants as water quality indicators (good and bad quality indicators) and effect of water pollution on aquatic animals in different aspects.
- Further in broad way study covers area point of view is there any other effect of pollutants on fresh water crab and human health via pollutants? The 3 year of research covers the almost pollutants (nitrate and phosphate) related all issues related to crab.

5] Methodology:

- Water sample will be collected using a pump or water bottles as chemical sampling.
- To study the any type of effects on hepatopancreas we will take section of particular part and observe under microscope and compare their structure with other less pollutant or pollutant free environmental crab parts.

- Crab will be captured by directly through hand or with the help of another capturing instrument.
- Once captured, various types of biological information will be collected from a crab, including length and weight.
- Nitrate: The nitrate concentration will be determined by using UV-Visible spectrophotometer at 220 nm and 275 nm. Since dissolved organic matter absorbed at 220 nm and NO3 does not absorb at 275 nm. (Elico - model SL159)

- To measure endogenous nitrate concentration in crab (crab muscles) and the residual nitrate content after curing are related to food quality and safety, we will use ion chromatography (IC) method.

- Determination of nitrate- nitrogen concentration can be done by automated colorimetry.

- To measure phosphate concentration, we'll use NMR spectroscopy and enzymatic reaction methods.

- Phosphate: The water sample is digested in H2SO4-K2SO4 mixture and taken from it a specified quantity, diluted with distilled water. Neutralized by sodium hydroxide solution, followed by ammonium molybdate and few drops of SnCl2 solution. The amount of phosphate is obtained from the calibration curve of blue colour produced.

6] Importance of study: -

InternationalStatus: -

- This research will be help to identify suitable level of pollutants in water.
- This research will be helpful for protecting crab species.
- It will be helpful for understanding the level of pollution and its effects on all fresh water crab.

National Status: -

- This research will be helpful for to examine the damage caused by pollutants (nitrate and phosphate) on tissues of crab.

Regional Status: -

- As in many regions of Maharashtra, crab used as one food type. So directly or indirectly pollutant affects our body through the crab.
- This study will helpful to know the pollutants effects on crab and is there any change will occur to use crab as food?
- This will help to save the crab species.
- This research will be help to improve the health condition of fresh water crab.

Scope of Study: -

- This study will give the idea about various effects of pollutants on fresh water Crab regarding various aspects like its growth rate, effects on hepatopancreas, muscles and its behaviour.
- It will help in controlling the decreasing population density of crab in pollutants effecting water. It also helps to know the effects of pollutant on human health via crab as one of the food.
- This study helps of examine the effects of nitrate phosphate on crab tissues.

7] Proposed work Plan: -

- Introduction.
- Methodology.
- Analysis of effects of pollutants on crab.
- Analysis to decrease the effects.
- Observation.
- Results.
- Conclusion.

8] Year-wise plan of work and target to be achieved: -

- 1st year:- introduction, referencing, methodology visit to collecting sites, animal (crab) collection and its preservation.
- 2nd year :- study of effects of pollutants on crab in different aspects.
- 3rd year:-Comparative study of pollutants based on its pollutant effects.
- 4th year:- study of water pollution (pollutants) with respect to crab and health.

9] Expected outcome: -

- Pollutants may cause some effects on crab body it may be growth rate, animal behaviour, on hepatopancreas, its muscles.
- High level of pollutants will be dangerous to crab life, it may leads to death of crab.
- There will may be difference occurred in pollutant free or suitable level of pollutant water bodies crab and pollutant present or pollutants in high amount water bodies crab.

10]References

1. **robert, steinberg and.** 2009.

2. **dede and deshmukh, jose et.al, pawar, kehayjas et.al,.** 2015. 2017, 2018.

3. **manickam, watkar nd barbate, pandey et.al.** 2013, 2014, 2015.

4. **et.al, altam.** 1987.

5. *an assessment of zooplankton population andseasonal variation in Lendi river dist nanded, MH, India.* **bimbisar d. waghmare, a.n. kulkarni.** s.l. : IJSER, 2014.

6. **Herzig, Rogozin.** 1987, 2000.

7. *identification of planktons behind girls hostel university of Abuja, Nigeria.* **Eronodu C.J, Solomon R.J.** s.l. : DRJPHET, 2017.

8. **baker.** 1976.

9. **Goswami.** 2004.

10. **Kribia et.al.** 1997.

11. *impact of industrial effluents on the diversity and population structure of Rotifer Fauna in river Basantar, Jammu (J&K, India).* **k k sharma, mikashi saini.** 2016.

12. environment.com. *google.com/environment.com.* [Online] www.environment.com.

13. novatx. *novatx.com.* [Online] novatxcom/driningwater.

14. globalseafood. *seafood.* [Online] globalseafood.org.

15. pubmed. *pubmed.ncb.* [Online] [Cited: 4 3 2022.] pubmed.ncbi.nlm.nih.gov.

16. *phytoplanton and its impact on water quality.* **claude, boyd e.** 2017, globalseafood.org.

17. **harris j m, vinobaba e.** omicsonline. *omicsonline.org/journal of ecosystem and ecogroups.* [Online] 19 9 2012. omicsonline.org/journal of ecosystem and ecogroups.

18. wikiidea. [Online] [Cited: 15 3 2022.]

19. https://www.sciencedirect.com/science/article/pii/B9780128118368000288

20.*https://www.cdc.gov*/Nitrate and Drinking Water from Private Wells.

21. *https://www.envirotech-online.com/news.*what-are-the-different-types-of-water-pollution

22. *https://sciencing.com/* - List of Water Pollutants

*23. https://www.frontiersin.org/articles***Esther Rosales, Gonzalo Del Olmo, Carolina Calero Preciado and Isabel Douterelo***Phosphate Dosing in Drinking Water Distribution Systems Promotes Changes in Biofilm Structure and Functional Genetic Diversity*

24. *https://www.watertechonline.com* - phosphates

25. *http://osse.ssec.wisc.edu/curriculum*earthMinifact2Phosphorus.pdf -**Spring Harbor** Environmental Magnet Middle School © James E. Kotoski, 1997

26. *https://www.knowyourh2o.com* - Phosphates in the Environment

27. Determination of nitrite, nitrate, and glucose-6-phosphate in muscle tissues and cured meat by IC/MS**GiovannaSaccani , EnricaTanzi, SilvanoCavalli, Jeff Rohrer***(https://pubmed.ncbi.nlm.nih.gov)*

28. Environmental monitoring systems laboratory office of research and development u.s. environmental protection agency cincinnati, ohio

29. *https://www.researchgate.net*(Barytelphusacunicularis in the tributaries of Godavari River Nanded (MS), India)**Sharda N. Padghane and Shivaji P. Chavan**

30. *https://www.cabdirect.org* (Effect of pesticides on the freshwater crab Barytelphusacunicularis (Westwood). **Shanmugam, M. ;Venkateshwarlu, M. ; Naveed, A.**

31. *http://www.mbimph.com/index.php* (copper and cadmium induced changes in blood sugar level of the crab, barytelphusacunicularis) **P. R. Machale A. K. Khan R. Sarojini R. Nagabhushanam**

32. Heavy Metal Concentrations in Different Body Part of Crab, BarytelphusaCunicularis from Godavari River **N. R. Sayyad**

33. *http://www.universalprint.org/wp-content*Correlation study between physico-chemical & morphometric parameters of freshwater crab (barytelphusacunicularis) at shaikh farms tq. Kannadgaikwadb.h2 ,**Mohammad Mohsin1 , Vidya Pradhan1** (International Journal of Universal Print ISSN: 2454-7263 ID: ACTRA 2018 077 Published Mar. 2018)

34. *https://d1wqtxts1xzle7.cloudfront.net/* (Behavioural studies of Lead nitrate impact on crab Barytelphusaguerini**Dube K.V**. (IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT))

35. *https://www.researchgate.net*Impact of physico-chemical parameters on gills of freshwater crab barytelphusacunicularis (westwood, 1836) **SeemaShrishailappaSakhare and Nitin AnandraoKamble** (International Journal of Pharmaceutical Sciences and Research- IJPSR (2015),

36. *https://www.webmd.com*crab: are there health benefits?

37. https://www.lenntech.com/rivers-pollution-quality.htm